

gular mixture of town and country folk, and of sedentary and active professions among the persons measured, but I have not yet verified this surmise.) Per-centiles were then drawn to the curve corresponding to abscissæ that were respectively 5 per cent., 10 per cent., 20 per cent., &c., of the length of the base line. As the length of the base-line was 275, these per-centiles stood at the graduations 13°8, 27°5, 55°0, &c. Their values, as read off on the sectional paper, are those which I have given in the Table.

It will be understood after a little reflection that the 9th rank in a row of 10, the 90th rank in a row of 100, and the 900th rank in a row of 1000, are not identical, and that none of them are identical with the 90th percentile. There must always be the difference of one half-place between the post which each person occupies in a row of n individuals, numbered from 1 to n , and that of the corresponding graduations of the base on which they stand, and which bear the same nominal value, because the graduations are numbered from 0 to n and begin at a point one half-place short of the first man, and end at one half-place beyond the last man. Consequently the graduations corresponding to the posts of the 9th, 90th, and 900th man in the above example, refer to the distance of those posts from the beginning at 0 of their several base lines, and those distances are related to the lengths of the base lines in the proportions of 8·5 : 10, 89·5 : 100, and 899·5 : 1000, which when reckoned in per-cents of the several base lines are 85, 89·5, and 89·95 respectively. The larger the number of places in the series, the more insignificant does this half-place become. Moreover, the intrusion of each fresh observation into the series separates its neighbours by almost double that amount, and propagates a disturbance that reaches to either end, though it is diminished to almost nothing by the time it has arrived there. We may therefore ignore the existence of this theoretically troublesome half-place in our ordinary statistical work.

There is a latent source of error that might affect such statistics as these, as well as many others that are drawn up in the usual way, which has not, so far as I know, been recognised, and deserves attention. It is due to uncertainty as to the precise meaning of such headings as 30-, 31-, &c. If the measurements, no matter whether they were made carefully or carelessly, are read off from the instruments with great nicety, then a reading such as 30·99 would fall in the column 30-, and the mean of all the entries in such a column might fairly be referred to a mean value of 30·5.

But if the instruments are roughly read, say, to the nearest half inch, the reading of a real instrumental value of 30·99, and even that of a real value of 30·76, would both be entered in the column 31-. The column 30- would then contain measurements whose real instrumental values ranged between 29·75 and 30·75, and the column 31- would contain those that ranged between 30·75 and 31·75; consequently, the means of all the entries in those columns respectively should be referred, not to 30·5 and 31·5, but to 30·25 and to 31·25. An error of a quarter of an inch in the final results might easily be occasioned by the neglect to note the degree of minuteness with which the instruments were read, and I strongly suspect that many statistical tables are affected by this generally unrecognised cause of error. The measurements at my laboratory were read to the nearest tenth of an inch and to a fraction of a pound, so I can afford to disregard this consideration. There was, however, a slight bias in favour of entering round numbers, which should have been, but were not (because I neglected to give the necessary instructions), rateably divided between the columns on either side.

A fuller description of the results of the measurements at the laboratory will appear next February or March in the forthcoming number of the *Journal* of the Anthro-

pological Institute, at which place the original data will ultimately be deposited.

FRANCIS GALTON

NOTES

IT having become known to some of the friends of the late Mr. Henry Watts, the well-known chemist, whose death occurred very suddenly on the 30th of last June, that his widow and family are in very straitened circumstances, an informal meeting was recently held at the Royal Institution. Those present resolved to form themselves into a committee, with power to add to their number, in order to collect a fund for the benefit of Mrs. Watts and those of her children who are not of an age to provide for their own support. Dr. Atkinson consented to act as secretary, and Dr. Perkin, President of the Chemical Society, as treasurer. Among the names on the committee are those of Sir F. A. Abel, Prof. H. E. Armstrong, Mr. William Crookes, Dr. Warren De La Rue, Prof. James Dewar, Prof. G. C. Foster, Dr. J. H. Gladstone, Prof. A. G. V. Harcourt, Dr. Hugo Müller, Dr. William Odling, Dr. W. H. Perkin, Dr. B. W. Richardson, Prof. W. Chandler Roberts, Sir H. E. Roscoe, Dr. W. J. Russell and Prof. A. W. Williamson. Mr. Watts's public labours for the advancement of chemical science may be said to have begun with the translation of Gmelin's "Handbook of Chemistry," the admirable English edition of which was prepared and edited for the Cavendish Society by him. This work occupies eighteen large octavo volumes, of which the first appeared in 1849, and the last in 1871. A work scarcely, if at all, inferior to this in magnitude, and one which has perhaps been of even greater service to English chemists, both scientific and industrial, is Watts's great "Dictionary of Chemistry," which appeared from 1863 to 1881, in eight volumes, containing altogether nearly 9700 pages. Mr. Watts also edited and largely added to the second volume of the late Prof. Graham's "Elements of Chemistry," published in 1858; he prepared several editions of Fownes's well-known "Manual of Chemistry," which he almost entirely re-wrote and made into virtually a new work; and in conjunction with Mr. Ronalds and Dr. Richardson, he prepared for Messrs. Baillière an elaborate treatise on chemical technology. Up to the time of his death, and for about thirty years previously, Mr. Watts was editor of the *Journal* of the Chemical Society, and in this capacity, as well as in that of librarian to the Chemical Society, he became personally known to and gained the friendship of very many among the Fellows of the Society. But although Mr. Watts's life was one of unremitting labour, the money return for his work was barely sufficient to enable him to provide for the daily wants of a delicate wife and a numerous family. It was not possible for him to provide for their future needs. But if he could not leave behind him pecuniary resources, he accumulated esteem and affection among all who knew him, which, it is confidently hoped, will prove a valuable legacy for those who were dependent on him. The facts of the case show that there is great need of whatever practical proof of their regard for him and appreciation of his labours Mr. Watts's friends, and English chemists generally, may be willing to make. For many years Mrs. Watts has been in ill-health, so that she cannot do anything for her own support and that of her family. One son is a permanent invalid, and the four youngest children have still to be educated. A considerable expenditure is therefore unavoidable for a good many years to come, if the children are to have a fair chance of a start in life. A considerable sum has already been promised in the way of subscriptions, but much more will have to be done in order that any substantial benefit may accrue to Mrs. Watts and her young family. Subscriptions will be received and acknowledged

by the Secretary, Dr. Edmund Atkinson, Portesbury Hill, Camberley, Surrey, or by the Treasurer, Dr. W. H. Perkin, the Chestnuts, Sudbury, Harrow.

M. MILNE EDWARDS has been nominated by the French Government Grand Officer of the Legion d'Honneur.

LECTURES in connection with the London Society for the Extension of University Teaching have been going on in Whitechapel now for more than six years. The number of tickets sold for the lectures during this period has been close upon 2000, and the ticket-holders have been nearly all artisans. The reports of the examiners, appointed by the Universities' Board, have shown that many of those attending the lectures are real students—a conclusion which is also borne out by the fact that the same subjects have been studied for several years in succession. It has been felt that a good reference library and reading room would be a great help to the existing students, as well as a means of attracting others. An opportunity for providing these advantages is now afforded in the "Universities' Settlement" in Toynbee Hall, where the lectures will in future be given, and a reading room be opened to the students. The Committee desire to stock this room with a good reference library—especially in the subjects of history, political economy, physics, and physiology—and will be very grateful for any assistance in this attempt to further higher education among working men and women in East London. Any one willing to help, either with books or with money, is requested to communicate either with E. T. Cook, 22, Albemarle Street, W. (Sec. London Society for the Extension of University Teaching), or Bolton King, 28, Commercial Street, E. (Hon. Sec. Whitechapel Local Committee).

THE mean-time clocks at the Royal Observatory, Greenwich, were put forward twelve hours a little before midnight of December 31, in order that the commencement of the civil day and the astronomical day might be identical from January 1, 1885. The public clock near the entrance to the Observatory will thus indicate the hours as recommended by the Washington Conference—*i.e.* reckoning from 0h. to 24h., starting from midnight. As the Greenwich observations for 1885 will not be printed until 1886, the proposed method can be tried for a year before the necessity of deciding on its adoption will arise. In writing to the Rev. T. E. Espin, President of the Liverpool Astronomical Society, the Astronomer-Royal says:—"The change that we propose to make at Greenwich is for the present provisional only, as it appears essential that it should be generally accepted by astronomers before it is introduced into any published observations. I am very anxious to avoid the confusion which would result from two systems of reckoning time being in use among astronomers. But as regards the ordinary public, it seems to me clear that for civil reckoning the day must commence at midnight, and in order to assist in familiarising the public with the reckoning from 0h. to 24h., I propose on January 1 to alter our public clock (which is numbered from 0h. to 24h.) by 12h., so that it will show civil reckoning instead of the old astronomical reckoning."

CHEMISTS will regret to learn that Dr. Edward Divers, Principal of the Imperial College of Engineering, Tokio, Japan, has met with a very serious accident, which it is feared will result in the loss of one of his eyes. He is understood to have been engaged in work in connection with the theory of acids, when a bottle, supposed to contain terchloride of phosphorus, exploded, causing him very severe injuries. Dr. Divers is well known as the author of many valuable chemical papers read before the Royal and other scientific societies.

MR. ALFRED TYLOR, F.G.S., who died on December 31 last, will be remembered as a promoter of technical education at a

time when its vital importance was little recognised, and the English manufacturing mind was generally set against it. He was intimately associated with Dr. von Steinbeis, whose energy in this direction did so much to give the little kingdom of Wurtemberg its industrial prominence in Germany. Mr. Tylor's work, "Education and Manufactures," arising out of his Jury Report on Metal Work at the Exhibition of 1862, was translated into German under the title "Industrie und Schule" (Stuttgart, 1865), and also appeared in Swedish. Mr. Tylor sat for some years on the Council of the Geological Society. His geological papers relate principally to the flow of rivers as connected with the erosion of valleys and the deposit of gravel-beds; they contain much systematised information, for instance, as to the mechanical action of the Mississippi and the Ganges. It is well known that his study of river-valleys and drift-gravels led him to the hypothesis of a post-glacial time of enormous rainfall, which he called the "pluvial period." The term, though not generally accepted, is found of use, to judge from its not unfrequent appearance in geological works.

THE death is announced, at the age of seventy-four years, of Dr. Andrew Findlater, for so many years connected with the editorial department of Messrs. W. and R. Chambers. Dr. Findlater wrote several of the scientific volumes in Chambers's well-known "Educational Course," and edited a revised edition of the "Information for the People." But his most important undertaking was the editing of "Chambers's Encyclopædia," the scientific articles in which hold so high a place, mainly through Dr. Findlater's knowledge, discernment, and tact in obtaining the right men to act as contributors. Dr. Findlater was offered the editorship of the new edition of the "Encyclopædia Britannica," but was induced to decline it.

WE read in the German papers that the Greek Government has offered to supply the marble, as it did in the case of Lord Byron's monument in England, for a national monument to be erected to Wilhelm Müller, the father of Prof. Max Müller, in his native town of Dessau. Wilhelm Müller is best known as the poet of the "Müller-lieder," beautifully set to music by Schubert. But the Greek Government, in the name of the Greek nation, wished to express its recognition of the great services rendered to the cause of Greek independence by Wilhelm Müller, "the Philhellenic Tyrtæus," whose "Griechenlieder" belong to the classical literature of Germany. Committees have been formed in Germany, Italy, Greece, and America. The English committee consists of Mrs. Jenny Lind-Goldschmidt, Sir Theodore Martin, Sir Robert Morier, Sir George Grove, J. A. Froude, and Prof. Buchheim. Subscriptions are received by Messrs. Williams and Norgate, 14, Henrietta Street, W.C.

BAVARIAN papers report the death, after a short illness, of Dr. Philip von Jolly, Professor of Mathematical and Experimental Physics in the University of Munich, in the seventy fifth year of his age.

A NEW association has been established among the students of the University of Paris. The first step of this institution has been the organisation of a public manifestation in honour of M. Chevreul, the director of the Museum, who is just completing his 100th year. He is the first French academician who has reached this advanced age since the death of Fontenelle, who died about 1750, a few days before completing his century. A little before his death Fontenelle was heard to say to one of his friends asking if he complained of some illness, "I have no suffering, but I am feeling merely an increased difficulty of living."

WE learn from *Science* that the "cold-wave flag," whose use has been inaugurated by the U.S. Signal Service during the past autumn, is intended to be displayed not only at the regular

stations of the Signal Service, but also at as many railway-stations and post-offices as possible, in order to spread the widest notice of the coming change of weather. The service cannot at present undertake to provide the flags or to pay for special telegrams to numerous local display-stations; but the cost of the flags (white, six feet square, with a two-foot black square in centre) is moderate, and can easily be borne by those interested in securing early indications of falling temperature; and in several parts of the country the telegrams are sent to all the stations on certain railroads that co-operate with the Signal Service, and thus promptly distribute weather forecasts to the towns along their routes. It is probable that the coming year will see a considerable extension of this kind of weather service.

M. JAMIN, the Perpetual Secretary of the Paris Academy of Sciences, has published, in the January issue of *Revue des Deux Mondes*, the essay on balloons, which we announced a few weeks ago. The academician takes a very moderate view of the success of the Meudon and Point du Jour experiments.

THE terrestrial disturbance in Southern Spain, which began with violent earthquake shocks on Christmas night, still continues, and other earthquakes are reported from Austria and Italy. From Vienna information comes of repeated shocks on the 4th inst. in the hot-spring district of Southern Styria, during which some slight damage was done, while on the afternoon of the same day a shock, perhaps of the same earthquake, was felt at Susa, near Mont Cenis, and one of greater force on the morning of the following day (January 5) at Velletri, near Rome. The seismic instruments at the observatory in Rome and at Rocca di Papa showed unusual activity on the 5th and previous days, especially at midday, and at night the mineral springs in the Island of Ischia have risen in temperature. It would thus appear that the present is a period of unusual seismic disturbance throughout Southern Europe. In Spain no day has passed since the 25th ult. without one or more severe shocks in the disturbed area. On the 31st ult. the tenth violent shock in a week occurred in Granada—the people left their houses for the night—and up to that date 10,000 people had left the town altogether. On the same day and on the 1st inst. shocks continued at Jaen, Torrox, Malaga, Benamargoza, and Velez Malaga. At Torrox buildings were thrown down, and the town has been wholly abandoned. At Nerja the church was damaged, and at Arenas del Rey 500 persons were either killed or injured. On the 1st inst. and the morning of the 2nd fresh shocks were felt at Nerja, Algarrobo, Granada, and Malaga. A number of towns and villages are reported completely destroyed and deserted. On the 2nd shocks were felt along the Mediterranean coast of Granada and Malaga. Up to noon on the 3rd inst., according to official statistics, 673 bodies were recovered from the ruins of towns in the province of Granada alone. On that day the shocks were renewed in Loja, Alhama, Jaen, and Velez Malaga, fissures being made in the ground. The town of Alhama, which has suffered most severely of all, is composed of two parts, the upper and lower. During the earthquake on Christmas night the upper town, situated on the side of a valley, fell into the lower portion. Over 1500 houses were destroyed, and more than 300 dead were recovered up to the 4th inst. It is calculated that 10,000 head of cattle were killed. Besides this, five churches, five convents and hospitals, the town-hall, the prisons, clubs, and theatre were destroyed, and 7000 people rendered homeless. On the 5th a sharp shock occurred at Granada a few minutes after 6 in the evening, and some slight shocks were felt at Malaga.

AT the Royal Institution, Prof. H. N. Moseley will, on Tuesday next (January 13), begin a course of five lectures on "Colonial Animals, their Structure and Life Histories"; Prof. Dewar will, on Thursday (January 15), begin a course of eleven lectures on "The New Chemistry"; and Dr. Waldstein will,

on Saturday (January 17), begin a course of three lectures on "Greek Sculpture from Pheidias to the Roman Era." The Friday evening meetings will begin on January 16, when Prof. Tyndall will give a discourse on "Living Contagia."

ACCORDING to the *North China Herald* there died a few months ago at Peking, the greatest Chinese mathematician of the present century. His name was Li Shan-lan, and he was Professor of Mathematics at the Foreign College in the Chinese Capital. He differed from the mathematicians of Europe in this respect, that he denied the non-existence of a point. "A point," said Prof. Li, "is an infinitesimally small cube," and in saying this he only reproduced the theories of Chinese sophists 2000 years ago. A great writer of that age put into the mouth of a sophistical being, whom he called the god of the northern sea, the following theory, which has its bearing on Prof. Li's heterodox views about a mathematical point: Subtlety is the occult part of the minute. Be a thing subtle or gross, it seems to me that it must have a form. A formless or unsubstantial thing cannot be distinguished as gross or subtle, discriminate as minutely as you will. What can be spoken of is the gross or palpable part of an entity; what can be imagined only is its subtle part or essence; but I take it that what is neither gross nor subtle can neither be talked of nor imagined.

M. LAUTH, the superintendent of the porcelain factory at Sèvres, is said to have discovered a new porcelain, which is far superior to the famous old Sèvres. After ten years' experiment and investigation he thinks he has produced a porcelain identical with that of China. Not only does it lend itself to artistic decoration, but it takes all kinds of glazes, and surpasses in beauty the colours obtained in China.

A PROPOSITION to connect Sicily with the mainland, by a submarine railway from Messina to Reggio, has been made by the Society of Engineering of Venice. It has been laid before the Minister of Public Works, who has referred it to a technical commission. A project by the French engineer who constructed the first railways in Rome to build a suspension bridge across the Straits of Messina, was laid at the time before Francis II.; but Garibaldi's campaign in Sicily, and the subsequent political events, caused it to be put aside.

WE learn from an Adelaide paper of November 3, 1884, that Mr. Clement L. Wragge has now extended his plan of operations on Mount Lofty, and has established, as a further experiment, a substantially equipped meteorological observatory there. At the Torrens Observatory readings are taken in direct connection with the observations on the Mount, 2350 feet.

PROF. SYLVESTER asks us to state that in his article "On the Genesis of an Idea," the footnote on p. 36, left-hand column, should read:—"It is one of Descartes' 'self-evident primary truths' that nothing which has happened could not have happened or have happened otherwise." The words "have happened" unfortunately dropped out.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii* ♂) from South Africa, presented by Mr. J. W. Moon; a Bonnet Monkey (*Macacus sinicus* ♀) from India, presented by Mrs. M. E. Mackern; a Brown Hyæna (*Hyæna brunnea*) from South Africa, presented by Mr. R. W. Murray; a Nubian Ibex (*Capra nubiana* ♂), a — Ibex (*Capra* — ♂), a Domestic Goat (*Capra hircus* ♀) from the Soudan, presented by Mrs. Laing; seven Angulated Tortoises (*Chersina angulata*), two Hoary Snakes (*Coronella cana*), a Many-spotted Snake (*Coronella multimaculata*), a Robben Island Snake (*Coronella phocorum*) from South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; a Golden Eagle (*Aquila chrysaetos*), European, deposited; a — Gibbon (*Hylobates* —) from Siam, purchased.